JUSTIFICATION

The Solar and Heliospheric Observatory (SOHO) is a project of international cooperation between the European Space Agency (ESA) and the US National Aeronautics and Space Administration (NASA) to study the Sun, from its deep core to the outer corona, and the solar wind. Built for ESA by a consortium of European space companies, it carries twelve complementary instruments, developed and furnished by twelve international consortia, and involving 39 institutes from fifteen countries. Nine consortia are led by European Principal Investigators, the remaining three by US PIs. More than 1500 scientists from over 30 countries are directly involved SOHO's research. Their findings have been documented in an impressive body of scientific literature and popular articles whose number continues to grow (more than 3000 articles in total, over 1500 of which appeared in refereed journals).

The SOHO spacecraft was launched by an Atlas II-AS from Cape Canaveral on 2 December 1995 and was inserted into a halo orbit around the L1 Lagrangian point, 1.5 million kilometers sunward of the Earth. SOHO orbits with the Earth around the Sun and maintains its position on a direct line of sight between these two bodies. From this vantage point SOHO has continuously monitored the Sun, 24 hours a day, 7 days a week and has provided an unparalleled breadth and depth of information about our daylight star, from its interior, through the hot and dynamic atmosphere, to the solar wind and its interaction with the interstellar medium. Research using SOHO observations has revolutionized our understanding of the Sun and solar-terrestrial relations and SOHO's easily accessible, spectacular data and basic science results have captured the imagination of the space science community and the general public alike. Solar winds, which can have devastating effects on electric circuits, reach SOHO just a few minutes prior to "attacking" satellites in Earth orbit or electric power generator stations on the Earth surface. The scientific contributions of SOHO's instruments have propelled solar physics into a new era of enlightenment. Some of the inner workings of the Sun's complex chemical and physical phenomena are understood in much more detail then thought possible only a few years ago.

NASA launched SOHO and is responsible for communications and daily operations. The focal point for mission science planning and instrument operations is the SOHO Experimenters' Operations Facility (EOF), located at NASA's Goddard Space Flight Center (GSFC). Control of the spacecraft was lost in June 1998, and only restored three months later through the heroic efforts of an ESA-NASA-contractor-university team. All 12 instruments were still usable, most with no ill effects. Despite the immediate failure of two of the three onboard gyroscopes and the later demise of the third (in December 1998), by February 1999, new, 'gyroless' onboard control software not only allowed the spacecraft to return to full scientific usefulness, but actually provided a greater margin of safety for spacecraft operations. After it went into space in 1995, SOHO was meant to operate until 1998, but it was so successful that ESA and NASA decided to prolong its life until 2003. This extension enables SOHO's scientists to compare the Sun's behavior when it had few dark sunspots (1996) with the peak of sunspot activity around 2000.